With Circular 2710.1A being withdrawn what do you do now for NTD sampling?

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What is the National Transit Database?

- Public transit agencies that benefit from Federal transit grant programs report their data to the NTD on:
  - Resource used
  - Service provided
  - Service consumed
- Service consumed includes:
  - Unlinked passenger trips (UPT), i.e., boardings
  - Passenger miles traveled (PMT)

What does NTD require statistically?

- Only service consumed may be estimated
- Must report 100% counts if having the ability to collect 100% counts reliably
- When estimating
  - Random sampling
  - 10% precision at 95% confidence (annual totals)
  - Sampling plans
    - Pre-approved by FTA or
    - certified by a qualified statistician

What happened to NTD recently?

- On 04/07/2015, FTA published the final Federal Register notice on its proposed changes to NTD
- FTA has withdrawn its NTD sampling circulars
  - Used for almost 40 years
  - Used widely
    - **2710.1A for bus and some other fixed-route**
    - 2710.2A for demand response
  - Institutionalized into agency data programs
- FTA has replaced them with the *NTD Sampling Manual*

Circular 2710.1A Sampling Plans
(referred to as interval-based)

Plan Number	Frequency of Sampling	Bus Trips in Sample	Total Sample Size for Year
1	Every Day	2	730
2	Every Second Day	3	549
3	Every Third Day	5	610
4	Every Fourth Day	7	644
5	Every Fifth Day	10	730
6	Every Sixth Day	15	915

Most popular

1. Sampling is done for individual sample days (183 days)

2. Same number of trips sampled on each sample day (3 trips)

3. *Constant interval* between sample days (1 day)

Commercial Software

- Some agencies do sampling and expansion with commercial software purchased mainly for other purposes

- Software came with 2710.1A sampling plans built in

- Non-interval-based sampling probably requires having software altered

- Examples:
  - Ridecheck Plus
  - Hastus

Why was 2710.1A withdrawn?

- Leads to over-sampling for many agencies

- Leads to under-sampling for some agencies

- Problems got worse in recent years
  - Designed for estimating both UPT and PMT, but most agencies report 100% UPT now
  - Designed for universal applicability, but more agencies probably do not fall into the design range of variability

What is the *NTD Sampling Manual*?

- Minimize sampling burden while meeting 10%/95% targets by offering
  - Solutions unique to individual agencies
  - A range of sampling methods to minimize sampling size for each unique situation
  - A tool for agencies to customize sampling plans
- FTA pre-approves these customized plans
- Sampling for each calendar period: weekly, monthly, or quarterly

How do you benefit from using 2710.1A or other interval-based sampling plans?

- **All users**
  - Likely easier to staff data collection
  - Much simpler to put together a full list of trips to be operated for sampling
  - Easier to account for frequent changes in schedule

- **Current users of 2710.1A**
  - Avoid the need to alter purchased software
  - Avoid the need to alter other data processes
  - Avoid any process changes until the start of using APC data for NTD reporting

As a user of 2710.1A, what do you need to do to keep interval-based sampling?

- Want to use your 2710.1A plan without change:
  - Need to determine if it meets the 10%/95% targets under your conditions
  - Cannot use it if the 10%/95 targets are not met
- Want to use other interval-based sampling plans:
  - Need to customize interval-based sampling plans to your conditions
  - For example: only need to sample 2 trips every other day rather than the 3 trips in 2710.1A
- Have your results certified

Using period-based sampling, how do you find out if you may be better off with interval-based sampling?

- Develop interval-based sampling plans that reflect your local conditions.

- Compare the annual sample sizes required by these interval-based plans with the plan you currently use

- Consider using interval-based sampling if
  - Sample sizes are similar, and
  - You like the simplicity of interval-based sampling

How do you evaluate 2710.1A plans or customize interval-based plans?

- Hire a qualified statistician before knowing the likely outcomes

- Have your staff do it using an established tool

- NCTR has developed one for you
  - Excel-based template
  - Free, simple, effective

- It is an add-on to the *NTD Sampling Manual* template

How does the tool work?

Interval-Based Template Sampling Plans

What is in the content of this template for developing interval-based sampling plans?

The content consists of five worksheets:

a) **IntervalIntro**: You should go over the general directions in this worksheet first.

b) **IntervalInput**: You must use this worksheet to enter your data.

c) **IntervalPlans**: You must go there to see the sampling plans you after you have entered your data into **IntervalInput**.

d) **IntervalCalculations**: It provides a number of characteristics of your service as reflected in the information you enter into **IntervalInput**. A extremely low value on a measure of how closely your UPT and PMT sample data relate to each other in this worksheet can provide an indication of potential errors in your sample data.

e) **IntervalPrecision**: You may use the information in this worksheet for determining whether you must revise your current template sampling plan after you have made major changes to your service since you started using your current sampling plan.

How do you represent your conditions in the tool?

Input for Interval-Based Sampling Plans

A. Weekly Days of Service & Daily Service Units

| Weekly Days of Service | 7 |
| Total Daily Service Units Operated | 500 |

Maximum if it varies across day types

B. PMT and UPT Sample Data by Day and Service Unit

Date	PMT Sample Data by Service Unit										UPT Sample Day by Service Unit									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
2-Jan-2006	126.2	248.0	83.8								37	33	23							
4-Jan-2006	58.3	122.7	206.1								13	20	27							
6-Jan-2006	98.6	16.7	34.4								18	4	12							
8-Jan-2006	184.9	111.6	98.9								42	22	19							
10-Jan-2006	19.6	73.5	26.5								2	16	5							
12-Jan-2006	150.3	292.6									35	67								
14-Jan-2006	76.9	16.2	1.6								25	3	5							

IntervalIntro | **IntervalInput** | IntervalPlans | IntervalCalculations | IntervalPrecision

What does the tool provide?

	Plan Number and Sampling Frequency					
A. Sample Size by Efficiency Option and Sampling Frequency	1	2	3	4	5	6
	Every Day	Every 2nd Day	Every 3rd Day	Every 4th Day	Every 5th Day	Every 6th Day
With 100% UPT — Daily Sample	1	1	1	1	2	2
With 100% UPT — Annual Total Sample	365	183	122	92	146	122
Without 100% UPT — Daily Sample	1	3	8	43	N/A	N/A
Without 100% UPT — Annual Total Sample	365	549	976	3,956	N/A	N/A

IntervalIntro IntervalInput **IntervalPlans** IntervalCalculations IntervalPrecision

CUTR

What do you do for NTD sampling?

Interval-Based Sampling Plans

	A	B	C	D	E	F	G	H	I
1		**Interval-Based Sampling Plans**							
3		A. Sample Size by Efficiency Option and Sampling Frequency							
5				Plan Number and Sampling Frequency					
6				1	2	3	4	5	6
7				Every Day	Every 2nd Day	Every 3rd Day	Every 4th Day	Every 5th Day	Every 6th Day
8		With 100% UPT	Daily Sample	1	1	1	1	2	2
9			Annual Total Sample	365	183	122	92	146	122
10		Without 100% UPT	Daily Sample	1	3	8	43	N/A	N/A
11			Annual Total Sample	365	549	976	3,956	N/A	N/A
		2710.1A	Daily Sample	2	3	5	7	10	15
			Annual Total Sample	730	549	610	644	730	915

Your annual sample is 72 trips with 100% UPT.
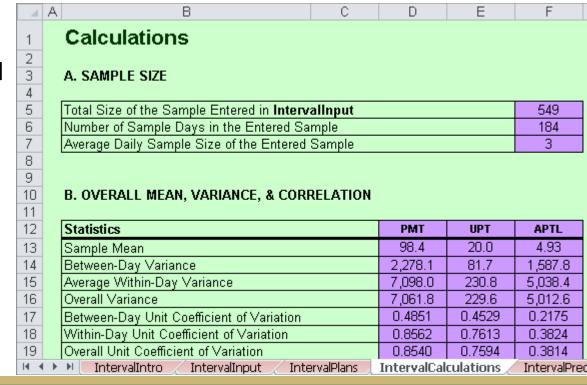
How do you have interval-based plans certified?

- Hope: FTA someday adopts the newer version
- Before that happens:
  - Staff with "a working knowledge of, and an education or background in, statistics"
  - Hire a qualified statistician with known outcomes
  - Show calculated statistics by the tool in certification

	A	B	C	D	E	F
		Calculations				
1						
2						
3		A. SAMPLE SIZE				
4						
5		Total Size of the Sample Entered in **IntervalInput**				549
6		Number of Sample Days in the Entered Sample				184
7		Average Daily Sample Size of the Entered Sample				3
8						
9						
10		B. OVERALL MEAN, VARIANCE, & CORRELATION				
11						
12		Statistics		PMT	UPT	APTL
13		Sample Mean		98.4	20.0	4.93
14		Between-Day Variance		2,278.1	81.7	1,587.8
15		Average Within-Day Variance		7,098.0	230.8	5,038.4
16		Overall Variance		7,061.8	229.6	5,012.6
17		Between-Day Unit Coefficient of Variation		0.4851	0.4529	0.2175
18		Within-Day Unit Coefficient of Variation		0.8562	0.7613	0.3824
19		Overall Unit Coefficient of Variation		0.8540	0.7594	0.3814

IntervalIntro | IntervalInput | IntervalPlans | IntervalCalculations | IntervalPrec

How do you get a copy?
http://ntd.transitgis.org/downloads

ntd.transitgis.org/downloads

NTD Sampling Manual

Dynamic Delivery Prototype

| Home | Filter the Manual | Browse the Manual | **Download the Manual** | Search the Manual | About the Manual |

- Full Manual
  - PDF
  - DOC
- Sampling Template
  - The NTD Sampling Template Version 2.0
  - The NTD Sampling Template Version 2.0 with Sample Data

How do you learn more about the tool?

- The tool contains instructions

- Covered by a 2012 FTA webinar on the *NTD Sampling Manual*

  - Listed at the NTD webinar page: http://www.ntdprogram.gov/ntdprogram/seminars.htm

  - Title: NTD Sampling Requirements and Guidance Webinar

  - Recording: http://www.youtube.com/watch?v=tS-0WGS9IqQ

- Contact me at xchu@cutr.usf.edu

How do you benefit from using the tool?

- Current users of 2710.1A
  - Continue interval-based sampling
    - Confirm your favorite 2710.1A plan meet 10%/95% targets
    - Provide smaller sample size for interval-based sampling
  - Stop using
    - Compare it to Sampling Manual plans
    - Savings from Sampling Manual plans too great to ignore
- Potential users of the tool
  - Compare to the sampling plan you currently use
  - Switch to interval-based sampling for simple structure if sample size does not increase much
- Provide necessary statistics for certification
- May avoid the need to hire a qualified statistician